

CLAIMS

1. A method for the total or partial freezing of a product (2), in particular a food product, according to which, in order to freeze the product on at least one of its surfaces, the product is brought in contact in a treatment container (1) with a refrigerating surface (1) which results from the use of a vibrating support and a film of a cryogenic liquid placed on said support, characterized by the use of the following steps:

- providing a heated temperature probe (10), which is located in the treatment container just before the exit of the products from the container and which can measure the temperature at the place where it is located,

- providing means (4, 12) for supplying the container with cryogenic liquid, which have a proportional valve (12);

- providing a data acquisition and processing unit (11) which can receive the temperature information provided by said probe and can retroact if necessary on the opening factor of said proportional valve.

2. The freezing method as claimed in claim 1, characterized in that the vibrating support has a slightly downward slope ending in a slight rise which can thus contain a certain quantity of cryogenic liquid, and in that said temperature probe is located substantially at the position where the cryogenic liquid accumulates.

3. The freezing method as claimed in claim 1, characterized in that the vibrating support has an upward slope.

4. The freezing method as claimed in claim 3, characterized in that a grille, which can filter some or all of the cryogenic liquid entrained with the

products as they progress upward, is arranged on some or all of the surface of the vibrating support.

5. The freezing method as claimed in one of the preceding claims, characterized in that:

- 5       - a product temperature probe (20), which can measure the temperature of the products after treatment, is furthermore provided in the passage of the products at the exit of the treatment container;
- a data acquisition and processing unit (21) is  
10 provided, which can receive the temperature information provided by said product temperature probe and can retroact if necessary on means for varying the inclination slope of the support and/or on means for  
15 varying the vibration frequency of the support and/or on the opening factor of said proportional valve.

6. The freezing method as claimed in one of the preceding claims, characterized in that:

- a safety temperature probe (13) is provided in the treatment container, slightly in front of the exit  
20 of the products from the container, and can measure the temperature at the place where it is located,
- said means for supplying the container with cryogenic liquid have an on/off valve (15);
- a data acquisition and processing unit (14) is  
25 provided, which can receive the temperature information provided by said safety temperature probe and can retroact if necessary in order to open or close said on/off valve.

7. The freezing method as claimed in claim 6,  
30 characterized in that said safety temperature probe is a heated probe.

8. The freezing method as claimed in one of the preceding claims, characterized in that the cryogenic liquid is liquid nitrogen.

35 9. The freezing method as claimed in one of the preceding claims, characterized in that said heated temperature or safety probe is a so-called double probe, with a double resistor, used in the following way:

- one of the two resistors is connected to an instrument which measures the value of the resistance and deduces the temperature therefrom by using a conversion table;

- 5       - the other of the two resistors is continuously supplied with a voltage in order to cause heating in it.

10.       An installation for the total or partial freezing of a product, in particular a food product, comprising a treatment container (1) which comprises a vibrating support capable of receiving a film of a cryogenic liquid, characterized in that it comprises:

- 15       - a heated temperature probe (10), which is located in the treatment container just before the exit of the products from the container and which can measure the temperature at the place where it is located,

- means (4, 12) for supplying the container with cryogenic liquid, which have a proportional valve (12);

- 20       - a data acquisition and processing unit (11) which can receive the temperature information provided by said probe and can retroact if necessary on the opening factor of said proportional valve.

11.       The freezing installation as claimed in claim 10, characterized in that the vibrating support has a slightly downward slope ending in a slight rise which can thus contain a certain quantity of cryogenic liquid, and in that said temperature probe is located substantially at the position where the cryogenic liquid accumulates.

12.       The freezing installation as claimed in claim 10, characterized in that the vibrating support has an upward slope.

13.       The freezing installation as claimed in claim 12, characterized in that a grille, which can filter some or all of the cryogenic liquid entrained with the products as they progress upward, is arranged on some or all of the surface of the vibrating support.

14. The freezing installation as claimed in one of claims 10 to 13, characterized in that it furthermore comprises:

5 - a product temperature probe (20) which is located in the passage of the products at the exit of the treatment container and which can measure the temperature of the products after treatment;

10 - a data acquisition and processing unit (21), which can receive the temperature information provided by said product temperature probe and can retroact if necessary on means for varying the inclination slope of the support and/or on means for varying the vibration frequency of the support and/or on the opening factor of said proportional valve.

15 15. The freezing installation as claimed in one of claims 10 to 14, characterized in that said means for supplying the container with cryogenic liquid have an on/off valve (15), and in that it furthermore comprises:

20 - a safety temperature probe (13) which is located in the treatment container, slightly in front of the exit of the products from the container, and which can measure the temperature at the place where it is located,

25 - a data acquisition and processing unit (14), which can receive the temperature information provided by said safety temperature probe and can retroact if necessary in order to open or close said on/off valve.

30 16. The freezing installation as claimed in claim 15, characterized in that said safety temperature probe is a heated probe.

35 17. The freezing installation as claimed in one of claims 10 to 16, characterized in that said heated temperature or safety probe is a so-called double probe, with a double resistor, used in the following way:

- one of the two resistors is connected to an instrument which measures the value of the resistance

and deduces the temperature therefrom by using a conversion table;

- the other of the two resistors is continuously connected to a voltage source in order to allow it to  
5 be supplied and to cause heating in it.